

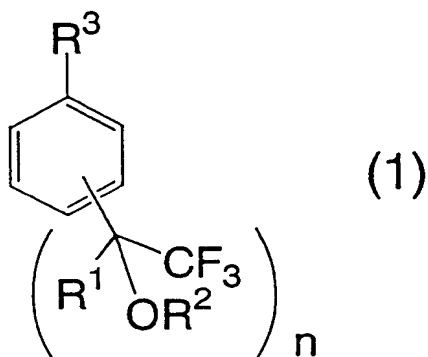
WHAT IS CLAIMED IS:

1. A process for producing a fluorine-containing, polymerizable styrene monomer represented by the formula (2), the process comprising the steps of:

(a) reacting a compound represented by the formula (1) with a compound represented by the formula (3), in the presence of a metal catalyst, thereby producing a compound represented by the formula (4);

(b) reacting the compound represented by the formula (4) with a base, thereby producing a compound represented by the formula (5); and

(c) reacting the compound represented by the formula (5) with hydrogen, in the presence of a metal catalyst and one of a phosphine and an amine, thereby producing the fluorine-containing, polymerizable styrene monomer represented by the formula (2),

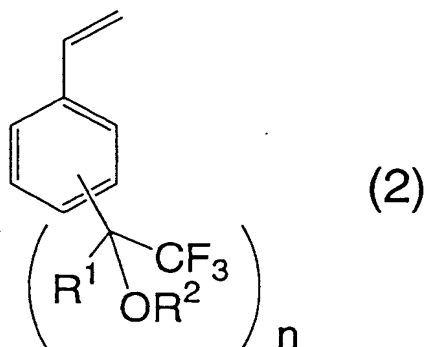


where  $R^1$  a methyl group or trifluoromethyl group,

$R^2$  is a hydrogen atom, an alkyl group, or an aryl group, each of the alkyl group and the aryl group independently having a carbon atom number of 1 to 25, independently having a straight-chain, branched or ring form, and independently and optionally having at least one of a fluorine atom, an oxygen atom, and a carbonyl bond,

$R^3$  is a halogen atom or alkylsulfonyl group, and

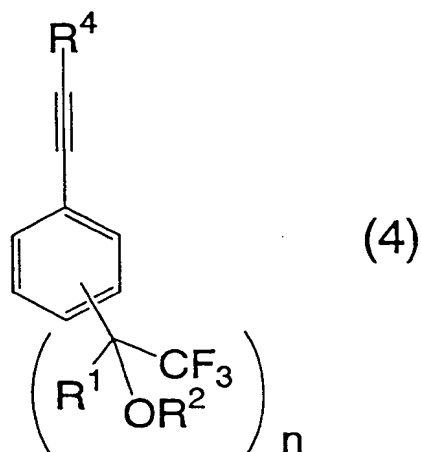
$n$  is 1 or 2,



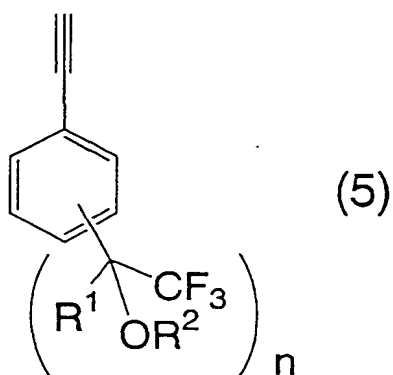
37 where  $R^1$ ,  $R^2$  and  $n$  respectively correspond to those of the formula  
38 (1),



42 where  $R^4$  is  $C(OH)R^5R^6$  or  $SiR^7R^8R^9$  where each of  $R^5$  to  $R^9$   
43 independently has a carbon atom number of 1 to 25, independently is an  
44 alkyl group or aryl group, and independently and optionally has, in place  
45 of a carbon atom, at least one of a hetero atom and a substituent, and  
46 where each of  $R^5$  and  $R^6$  independently and optionally contains a  
47 fluorinated alkyl group,



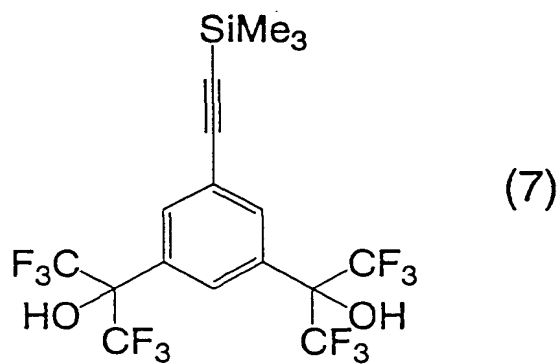
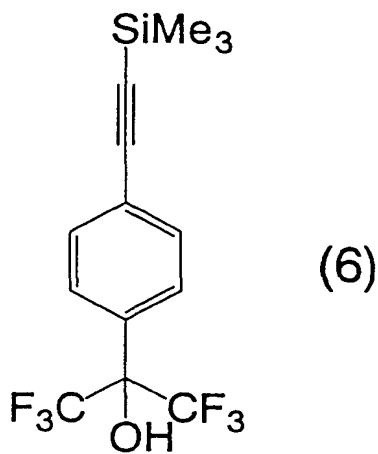
57 where  $R^1$ ,  $R^2$  and  $n$  respectively correspond to those of the formula  
58 (1), and  $R^4$  corresponds to that of the formula (3),

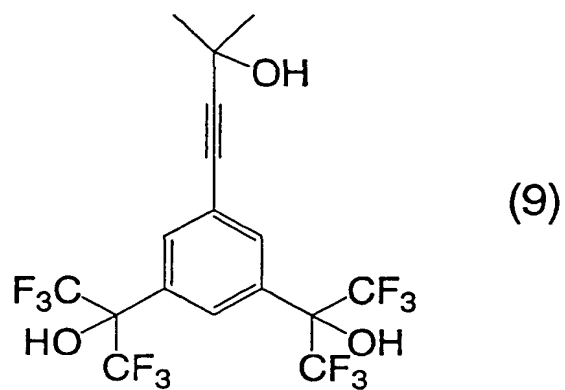
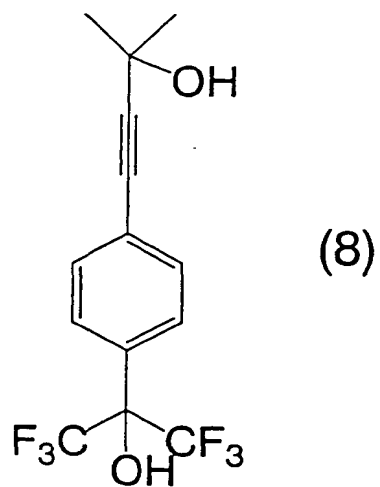


67 where R<sup>1</sup>, R<sup>2</sup> and n respectively correspond to those of the formula

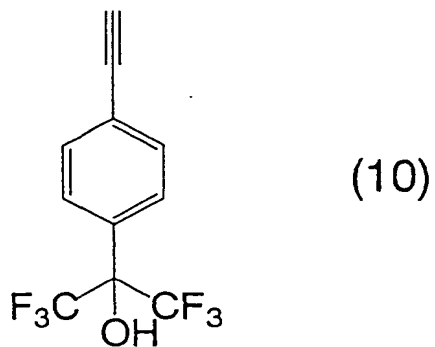
68 (1).

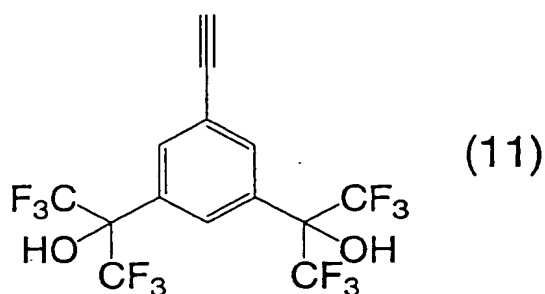
1 2. A process according to claim 1, wherein the compound represented  
2 by the formula (4) is a compound represented by one of the formulas (6) to  
3 (9).





1 3. A process according to claim 1, wherein the compound represented  
2 by the formula (5) is a compound represented by the formula (10) or (11).





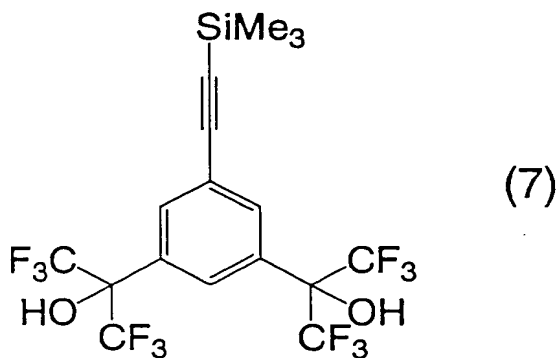
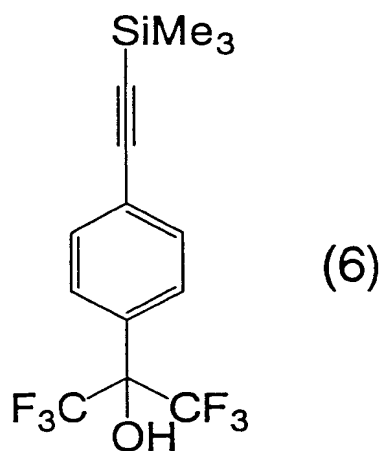
- 1 4. A process according to claim 1, wherein R<sup>1</sup> of the formula (1) is a  
2 trifluoromethyl group.
- 1 5. A process according to claim 1, wherein R<sup>2</sup> of the formula (2) is a  
2 hydrogen atom.
- 1 6. A process according to claim 1, R<sup>3</sup> of the formula (1) is a bromine  
2 atom, iodine atom, or trifluoromethylsulfonyl group.
- 1 7. A process according to claim 1, wherein the metal catalyst of the  
2 step (a) is selected from the group consisting of copper complexes, iron  
3 complexes, cobalt complexes, nickel complexes, rhodium complexes,  
4 palladium complexes, ruthenium complexes, platinum complexes, and  
5 combinations of these complexes.
- 1 8. A process according to claim 1, wherein the metal catalyst of the  
2 step (a) is a combination of a palladium complex and a copper complex.
- 1 9. A process according to claim 1, wherein the metal catalyst of the  
2 step (a) comprises a palladium complex, and wherein the step (a) is  
3 conducted in the presence of a phosphine.
- 1 10. A process according to claim 8, wherein the step (a) is conducted in  
2 the presence of a base.

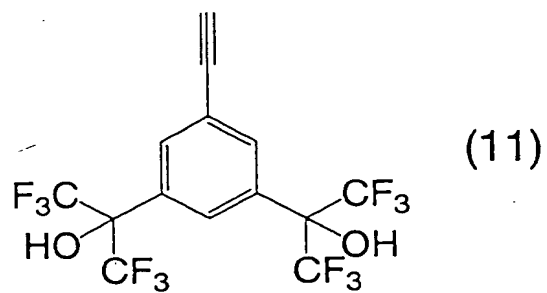
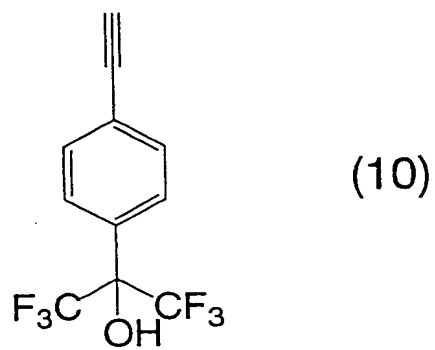
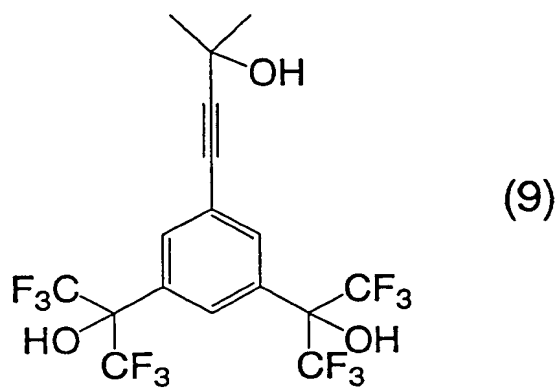
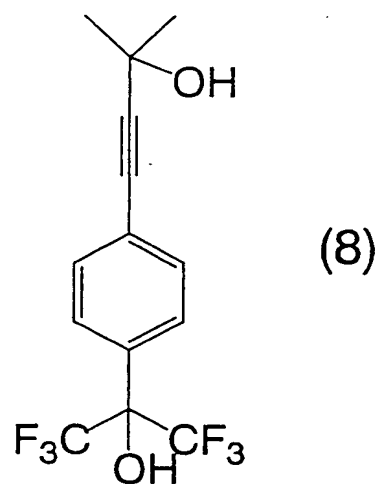
1 11. A process according to claim 1, wherein the base of the step (b) is  
2 sodium carbonate or potassium carbonate.

1 12. A process according to claim 1, wherein the metal catalyst of the  
2 step (c) comprises a metal selected from the group consisting of palladium,  
3 platinum, rhodium, ruthenium, and nickel.

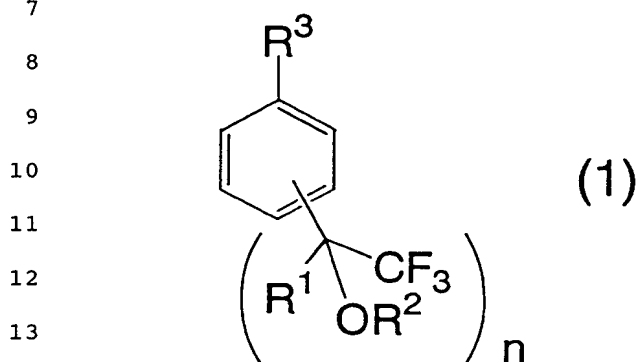
1 13. A process according to claim 12, wherein the metal catalyst of the  
2 step (c) comprises palladium and one of barium sulfate and calcium  
3 carbonate.

1 14. A compound represented by one of the following formulas (6) to (11),  
2 which is an intermediate in the process according to claim 1.





15. A process for producing a fluorine-containing, polymerizable styrene monomer represented by the formula (2), the process comprising the step of reacting a compound represented by the formula (1) with a compound represented by the formula (12), in the presence of a metal catalyst, thereby producing the fluorine-containing, polymerizable styrene monomer represented by the formula (2),

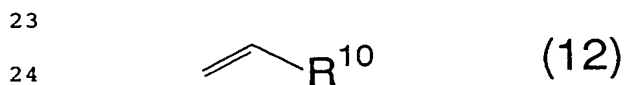


15 where R¹ a methyl group or trifluoromethyl group,

16 R² is a hydrogen atom, an alkyl group, or an aryl group, each of the  
17 alkyl group and the aryl group independently having a carbon atom  
18 number of 1 to 25, independently having a straight-chain, branched or ring  
19 form, and independently and optionally having at least one of a fluorine  
20 atom, an oxygen atom, and a carbonyl bond,

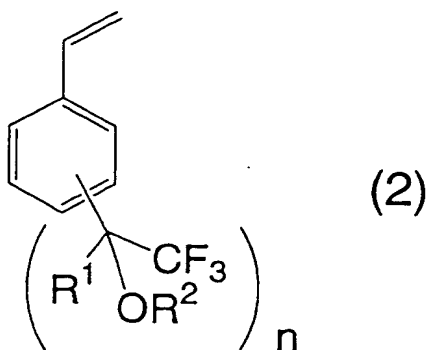
21 R³ is a halogen atom or alkylsulfonyl group, and

22 n is 1 or 2,



26 where R¹⁰ is a hydrogen atom, MgX, SnR¹¹R¹²R¹³, SiR¹⁴R¹⁵R¹⁶, or  
27 B(OR¹⁷)(OR¹⁸) where each of R¹¹ to R¹⁸ independently has a carbon atom  
28 number of 1 to 25, independently is an alkyl group or aryl group, and  
29 independently and optionally has, in place of a carbon atom, at least one of  
30 a hetero atom and a substituent, and where X represents a halogen atom,





38 where R<sup>1</sup>, R<sup>2</sup> and n respectively correspond to those of the formula  
39 (1).

1 16. A process according to claim 15, R<sup>3</sup> of the formula (1) is a bromine  
2 atom, iodine atom, or trifluoromethylsulfonyl group.

1 17. A process according to claim 15, wherein the metal catalyst is  
2 selected from the group consisting of iron complexes, cobalt complexes,  
3 nickel complexes, rhodium complexes, palladium complexes, ruthenium  
4 complexes, and platinum complexes.

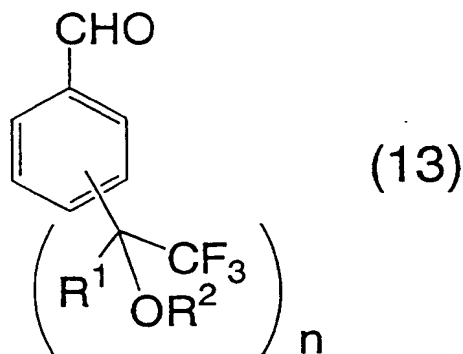
1 18. A process according to claim 15, wherein the step is conducted in the  
2 presence of a phosphine.

1 19. A process according to claim 15, wherein the step is conducted in the  
2 presence of a base, in case that R<sup>10</sup> of the formula (12) is a hydrogen atom  
3 or B(OR<sup>17</sup>)(OR<sup>18</sup>).

1 20. A process according to claim 15, wherein the step is conducted in the  
2 presence of a nucleophilic reagent, in case that R<sup>10</sup> of the formula (12) is  
3 SiR<sup>14</sup>R<sup>15</sup>R<sup>16</sup>.

1 21. A process for producing a fluorine-containing, polymerizable styrene  
2 monomer represented by the formula (2), the process comprising reacting a

compound represented by the formula (13) with a compound represented by the formula (14) or (15), in the presence of a base, thereby producing the fluorine-containing, polymerizable styrene monomer represented by the formula (2),



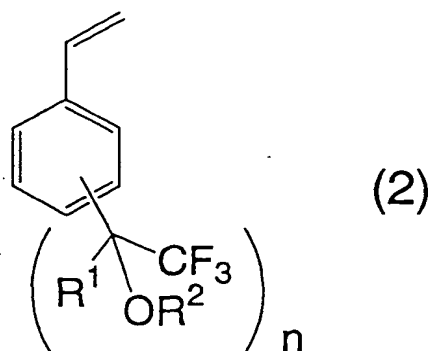
where  $\text{R}^1$  a methyl group or trifluoromethyl group,

$\text{R}^2$  is a hydrogen atom, an alkyl group, or an aryl group, each of the alkyl group and the aryl group independently having a carbon atom number of 1 to 25, independently having a straight-chain, branched or ring form, and independently and optionally having at least one of a fluorine atom, an oxygen atom, and a carbonyl bond,

$n$  is 1 or 2,



where  $\text{R}^{19}$  is a  $\text{C}_{1-25}$  alkyl or aryl group and optionally has, in place of at least one carbon atom, at least one of a hetero atom and a substituent, and where  $\text{X}$  represents a halogen atom,



38 where R<sup>1</sup>, R<sup>2</sup> and n respectively correspond to those of the formula  
39 (13).

1 22. A process according to claim 21, wherein the reacting is conducted  
2 by the steps of:

3 (a) treating the compound represented by the formula (14) or (15)  
4 with a base in a solvent, thereby obtaining a product containing a  
5 carbanion; and

6 (b) adding the compound represented by the formula (13) to the  
7 product of the step (a), thereby producing the fluorine-containing,  
8 polymerizable styrene monomer represented by the formula (2).